SCIENCE.—SUPPLEMENT.

FRIDAY, MARCH 12, 1886.

THE ROCKY MOUNTAINS AS SEEN FROM THE CANADIAN PACIFIC RAILWAY.

THE foot-hills of the Canadian Rockies are not like those of the south, — huge piles of sandstones, bristling with 'monuments,' and hirsute with sparse forest. After a few smooth, grassy benches and rounded hills, here come precipitous ranges of real mountains, scarcely less imposing than those of the central mass. Trees among the outer benches are rare. You see some willows, a hemlock, and the stubbed Pinus albicollis, which is not good as timber. Near Calgary the first of the magnificent Douglas spruces present themselves, — those gigantic and valuable timber-trees, for which the north-west coast is famous. They are of small size here, and stand in little clumps in the ravines.

The Rocky Mountains at this point have trended so far westward, that here they are overtaken only in the meridian of Salt Lake. The first line of heights is a rank of bluffs with almost vertical faces, each ledge marked by well-kept snow, which stretches away northward in orderly array. This is the Palliser range. The most prominent point of it is a forward-set peak visible from a wide radius of plains. In shape it is like a pretty tall stump, or the lower half of a lighthouse, and is called the Devil's Head; but the Indians, with better discernment, say it is the Devil's *neck*, and have a story about the disappearance of the head it once sustained. Behind the Palliser is the slaty Sawback range, from beyond which comes the Bow River, through deep cuttings.

In these foot-hills lives a small Indian tribe, of Dakotan stock, termed Stonies, who are fine-looking fellows and good hunters. They came there within a generation or two, and never go out on the plains except in war-raids against the Crees or the half-breeds, to whom they have given much trouble. The Hudson's Bay company set up its southernmost trading-post among them a few years ago, called the Old Bow Fort; and close by they now live on a reservation, the station for which is Morleyville.

Though the mountains here seem grand enough, having a sublimity not easily equalled among any of the loftier ranges southward, yet they must be spoken of as 'depressed' north of the boundary, since the tallest peaks do not much exceed 11,000 feet above the sea, and none of the passes are over half that. There are several fine passes over the first range, between the parallels of 49° and 53°. The southern one is Kootenay, much used formerly by the Indians, then Howse's, then that where the Kananaskas heads, then the one taken by the Canadian Pacific railway up the Bow and across to the valley of the Kicking Horse, and lastly the Yellow-head, or Leather pass under latitude 53°. Many of the principal peaks in this range were long ago named Balfour, Forbes, Hooker, and Brown, by the lamented botanist Douglas, after English men of science.

The breadth of the Rocky Mountain system (six hundred miles) in the middle United States is narrowed northward, until in Canada it consists of three compact serrations. The easternmost bounds the plains, and stretches from the sources of the Missouri to those of the Peace and the Yukon. Its eastern face presents a bold front; but its western flank is more broken up, and, not far from the boundary line, gives source in two 'mother-lakes' to the mighty Columbia, which thence flows northward in a powerful stream until it has passed the fifty-second parallel, nearly two hundred miles north-west of its starting-point. Then the mountains upon its left break down; and the Columbia, turning sharply around their head, moves straight southward on its course to the sea. Stretching north and south between Kootenay lakes and the great bending of the Columbia, stands the magnificent second range of mountains, — the Selkirks.

The course of the Columbia after it has turned southward around the head of the Selkirks is beset by lofty walls as before, for west of its banks rises a third chain, called the Gold range, whose farther slopes feed the Fraser and Okinakane. Thus three unexplored, lofty, and glacial ranges of mountains, and two first-class river-crossings, opposed themselves to the engineers of this railway when the northern route was abandoned and the present line accepted.

The profile of the Rockies seen at the eastern entrance is extremely irregular. There is no stately line of granite domes, nor bristling quartzite peaks, nor symmetrical volcanic cones: the sky rests upon a jagged wall, every elevation having some angular and abrupt form quite unlike its neighbor.

All this grandeur of outline, which gives a tenfold savage aspect, is intensified by the excess

of snow and ice borne winter and summer upon their naked heads, — the most striking fact in their scenery, a description of which cannot be attempted here.

The Bow River, at the point where it breaks through its 'gates,' is a swift, deep stream of pea-green water. We follow it for several miles through a low forest, which occupies a large valley parallel with the main range, and between it and an outlying one, which is somewhat analogous to the parks of Colorado. Near the southern end of this valley is the station Banff, — the locality of a huge sulphur-spring. This occupies a pit which has a chimney-like entrance, and broadens below into a chamber of considerable size. In the bottom of this boils up a powerful spring strongly impregnated with sulphur, and almost too hot for bathing. The interior of the cavity abounds in masses of crystals, splinter-like, brittle, translucent amber in color, and extremely beautiful, which, fortunately, are carefully protected by the owner. That the spring was formerly more copious, is shown by the oven-shaped tank it has built up more than forty feet above the present surface of the water.

Just beyond the impressive berg named Castle Mountain, which, like most of its fellows, has as many curious forms as you can find changed points of view, in the valley of the Bow River, the traveller gets sight of the first of the great glaciers which are a distinguishing feature of the scenery in the Rocky Mountains of British Columbia. It is a broad, crescent-shaped river of ice, the farther part of which is concealed behind the lofty yellow cliffs hemming it in. You seem to be almost on a level with it, and near at hand; but it is a dozen or more miles away, and fully fifteen hundred feet above you.

The forest is not noteworthy until the top of the pass (altitude about five thousand feet) is reached, when the eye gazes across miles of magnificent evergreens, filling the great depression through which the young Kicking Horse rushes from cataract to cataract, down to the westward. The Cathedral and Mount Stephen represent the supreme heights of the continental divide at this point. They are magnificent mountains, and surrounded by scores like them, unspeakably precipitous, rugged, and noble. On every side, as you make your way along, stand great cliffs, bearing prodigious weights of clear ice or almost equally solid and glittering masses of snow. In spite of this ruggedness, the gradient adopted by the railway is surprisingly low, and trains will be able to run at great speed; a schedule allowing only seventy-two hours between Montreal and the Pacific going into operation next May.

It is rather farther down from the summit on the western side than on the eastern. The exit is made through a narrow cañon, picturesquely filled by the turbulent stream; and beyond, with the grandest surprise, you emerge upon the valley of the Columbia, and are face to face with the long, splendid range of the Selkirks.

Crossing the Columbia on a fine truss-bridge, the railway runs down its margin, close under the steep, wooded foot-hills of the Selkirks. Several miles below, it turns into the narrow gateway through which the Beaver finds a straitened exit (like all the streams of this region), and ascends its gorges by ingenious engineering to the summit of the range, thirty-four miles (by rail) west of the Donald crossing, and 4,350 feet above the sea.

The principal difficulty in construction, along this part of the line, was occasioned by the many torrents which come down the very steep mountain-side, often in splendid cascades. To span these fierce torrents by bridges or culverts which should not fail, required great skill and liberal expenditure.

Among these bridges is the loftiest wooden structure of its kind in the world. It crosses Stony Creek, — a noisy rill at the bottom of a V-shaped channel cut deeply into the soft rock of the hillside; and the track is no less than 295 feet above the water. This bridge is supported upon two towers of wooden crib-work, erected upon masonry the foundations of which are solid rock 75 feet below the surface. This bridge is about 750 feet long, cost $250,000, and was built in a very short time. It is exceeded in height by only one railway-bridge in the world, — the iron one lately put up at Kinzua, Penn.

The approach to the summit is through a narrow passage between enormous precipices, down one of which pitches a waterfall several hundred feet in unbroken height, white and dusty like snow; and at the summit the glacier of which it is the outlet comes into view.

This glacier has an area of several miles, and its head cannot be seen from the pass. It is wedge-shaped, and in August was so dusty white, where the surface had been honey-combed by the sun, or powdered by the frequent storms, that it was not easy to say where it ceased and the inclined snowbanks lying under the shelter of the huge black combing began. Streaks, patches, and marbling of vivid blue (or, in some lights, green) could always be detected, however, where the solid ice was exposed; and the whole picture was irresistibly attractive. The foot of this glacier is approximately 7,350 feet above the sea, and is overlooked by Carroll's and two or three neighboring peaks, towering three thousand feet higher.

A little to the westward are other smaller and more easily accessible ice-masses, which plainly show a recent retreat; and two miles west of the summit one comes into view of the greatest of the visible Selkirk glaciers. It is overlooked by the stately monolith of Syndicate Peak, and the ice comes curving down to within a mile of the railway, feeding a copious stream. It is only about a thousand feet above the level of the rails; and, when a trail has been cut through the thickets in the ravine, it will be very easily reached, though one should no more attempt to go upon it without proper ice-creepers, ropes, etc., than he would in the Swiss Alps. I predict that the Agassiz glacier, if I may so name it, will be as famous an object of adventurous pilgrimage in a few years as any in Europe. ERNEST INGERSOLL.

THE ORIGIN OF HUMAN RACES AND TYPES.

ONE of the most inexplicable subjects in the evolution of man has been his racial persistency. The teachings of Agassiz are yet familiar, and the thorough and abundant testimony of Morton, Nott, and Gliddon has demonstrated the permanency of the great races of mankind. The peculiar physiognomy of the Jew stands out as clearly in the early Egyptian records as at the present day. Food, climate, the most diverse environmental conditions, all appear to cause but little modification in racial type. The evidence from his earliest known periods of existence throws but little light upon his immediate origin, and the opponents of evolution have long found great satisfaction in the few proofs of lower affinity that his fossil remains present. Certainly there must have been factors in his earliest development that we have not yet taken into account. When and where did the African, the Caucasian, the Malayan races first become fixed, and why have the causes that long ago led to their differentiation ceased to be active? An answer to this question, deserving consideration, has lately been attempted by Moritz Wagner (*Kosmos*, 1886, p. 23).

It has long been recognized that one of the strongest factors in the artificial production of new varieties is in-and-in breeding, — the repeated crossing, within narrow limits, of the progeny of related parents. It is rarely in any other way that the impression of peculiarities can be combined and not antagonized in the offspring. All breeders or growers are aware that the organism, be it vegetable or animal, acquires with every such repetition greater plasticity and capability of change, and that it can arrive at a considerable degree of differentiation only when free crossing is hindered or prevented for a sufficient length of time for these variations to become fixed, and not dissipated. In nature, strong proof of the same law is afforded by the faunal and floral peculiarities of regions isolated by natural barriers. The Galapagos and the Hawaiian islands, notwithstanding the uniformity of climates and general conditions, show striking diversities in animal and plant life among themselves, — the result of crossing among nearly related forms. Isolation, from whatever cause it may be due, throughout all animal and vegetable life, brings almost inevitably variation, due to the limitation of crossing, and the consequent fixation of characters.

But, in both of these respects, man has, in all his known history, been strikingly at variance with all other members of both the animal and vegetable kingdoms. In him alone, among all living creatures, exists the instinctive aversion to crossing between near blood-relations, — an aversion that predominates in every grade of civilization, from the cultivated races to the Eskimo, Hottentot, or Australian. Indeed, among the lowest tribes, the aversion is often strongest, and incest not unfrequently is punished by death. Most assuredly, man will not form an exception to a law so potent for change among other animals; and we see, in this custom of marriage between those unrelated, the most important factor in the production of varieties removed, and we can understand the difficulty of the formation of new races. The very acceptance of man's origin recognizes the certainty that some time in his development this instinct has been acquired. In the earliest period it did not exist, and he was then subject to the same laws of variation as the ape and the dog. It was to this period that the chief divisions of mankind evidently date.

Every thing goes to indicate that man's origin extends back far into the pliocene age; and evidently in his early stages he differed little, in his habits, from wild animals of the forest. Without clothes and habitation, he depended upon the free gifts of nature for food and shelter, without family instincts, and, what seems to be a necessary concomitant, without any sexual aversions whatever. With the great climatic changes of the glacial period, all this was changed. The struggle for existence became bitter: sustenance, shelter, and clothes had then to be acquired by the exercise of brain and hand. Migrations to the most favored and isolated locations were the inevitable result, and the necessity of protection of offspring became the contingency of existence. Family life took the place of more brutal instincts,

and the child remained longer dependent upon the parent. But with the constant association of near relatives an aversion was acquired to close intermarriage, resulting in the custom, or rather instinct, that now characterizes all classes of mankind. The chief factor of change thus ceased its operation, but the formation of races had already occurred.

Thus the author would account for those primitive and wide divergences that must once have taken place. With his development and acquisition of language, man became the most cosmopolitan of animals; tendency to further divergence was checked, and is now rather toward homogeneity. Anthropologists are fast recognizing the futility of separating tribes and classes by cranial classification. Very great variations are found between dolichocephalic and brachycephalic types among all civilized or uncivilized races. The pure Germanic race of the blond type is disappearing, as Virchow has shown, and greater racial uniformity is becoming apparent. The larger part of the German people is a mixture between the light-skinned indigenous race and the dark-skinned Indo-European races. Free crossing prevents the further formation of striking changes; but, with the development of civilization, a new and subordinate factor is taking, in a measure, its place, — that of national and social caste, which tends to the formation of minor variations. The peasant and the noble, the Jew, the German, Frenchman, or Englishman, — all are differentiated by very tangible characters, the result of partially restricted crossing, from social causes. Thus in man's history we see the unrestricted crossing of bestiality, fruitful in change; the acquired humane instincts averse to pairing between blood-relations, and eager for remote and strange mates; and, finally, the prejudices of social and political castes that lead to the formation of minor variations.

AN OLD-FASHIONED BOOK.

This volume seems to be in its principal features an abridged translation of Weber's 'Lehrbuch der weltgeschichte,' to which, indeed, Dr. Fisher acknowledges his great indebtedness, especially as to ancient and mediaeval history. As to the need of some such book as the one under review, there can be no question. Teachers still, even in many of our best colleges, use the old mechanical method of teaching history. We call it the mechanical method with no intention of discrediting it; for there is no doubt but that, in the case of the great majority of our history teachers, the safest way is to put a good book into the hands of the student, and make him commit to memory so many pages a week. To be sure, he forgets most of his facts as soon as possible after the examination. But, on the other hand, if the book is a good one, he has learned very few things which will have to be carefully unlearned in after-life. The best example that occurs to us, of the working of this system, is with regard to the teaching of botany in one of our smaller sectarian colleges not so very many years ago. The text-book was large, and well supplied with poor pictures. The class came in regularly: they could not be absent without excuse. As soon as the man in charge had satisfied himself that all were present, he said to N. or M., 'Proceed.' N. or M. proceeded to recite from memory the opening paragraph of the day's lesson. When the man in charge thought he had recited enough, he ordered another boy to 'proceed.' Then came reviews and second reviews. At the end of the term or year the boys knew the book by heart. As they had never analyzed a flower, or applied the knowledge thus gained in any way, their botanical wisdom was very slight. To this day, most of them know absolutely nothing of botany, though still able to recite page after page of the large and very dry text-book. So it is with history. A man may know a hundred dates. He may know, for instance, that Magna Charta was signed by King John on June 15, 1215; but if he knows nothing about the document itself, what it meant, who drew it up and why, under what circumstances it was signed and why, he may be said to know nothing about the most interesting document in the history of the Anglo-Saxon race. He may know, too, that the first perfect parliament was summoned by Edward I.; but, if he knows no more, he may with truth be said to be utterly ignorant of an event which John Richard Green has denominated 'the most important event in English history.' Still, books giving such general knowledge of the world's history have their place.

Professor Fisher has undoubtedly put much time and labor into the making of this book. Portions of it are well done — exceedingly well done. It is also very well proportioned, and in its arrangement no fault can be found. We are conscious, too, of the enormous labor involved in getting out such a work. But all these considerations only add to our regret that Dr. Fisher did not use still more care in his original writing, and exercise very much more vigilance in his proof-reading; then he might have produced a book that would have remained the standard work, of its size, for a very long time. Let us call attention to

Outlines of universal history. By G. P. Fisher. New York, *Ivison, Blakeman, Taylor & Co.*, 1885. 12°.

a few errors, which, though trifling in themselves, have given us a distrust of the whole book, and especially of that portion dealing with modern history.

The first sentence is from p. 295, and is as follows: "John (surnamed Sansterre or Lackland, a name given to younger sons who died before they were old enough to hold fiefs) was chosen king." Of course, this statement is absurd. It is singular that Professor Fisher should not have seen it; for the definition is correctly given by Miss Thompson, whose admirable 'History of England' the author seems to have read with some care: "John, surnamed Sansterre or Lackland (a name given to younger sons whose fathers died before they were of age to hold fiefs)." Then, again, take the following from p. 315. The author has been speaking of Llewellyn, and goes on to say, that, "when a rebellion broke out several years later, Wales was conquered, and the leader of the rebellion executed (1273)." Now, of course, the author knows that Llewellyn was killed in a chance skirmish, and that it was his brother David who was executed in 1283, not 1273; but he should have said so. Then, too, on the very next page (316), the date 1292, which is assigned to the defeat of Warrenne by Wallace at Stirling Bridge, should be 1297; while on the following page (317) Isabel is said to have returned from France, bent on the overthrow of her husband, Edward II., in 1325, instead of 1326. Now, here, on three successive pages, are three dates — and three very important dates — wrongly given. No doubt they are misprints, or mere slips of the pen; but the greatest care should have been taken to prevent just such errors. It must not be supposed that such failings are confined to this part of the book, or to English history, as, in whichever direction we have turned, the same want of care has been observed. In American history, in European history, and even in ancient history, similar errors have been found.

The sections devoted to the history of the people — to the literature, theology, art, etc., of the different periods — are good as far as they go. The maps of classical times are mainly printed from the same plates as those in the 'Standard classical atlas,' issued by the same publishers (*Science*, vii. p. 51): those relating to more modern events, while not so large, are clear and fairly accurate. The most serious omission in this part of the book is the lack of a map showing the partitions of Poland. Taken altogether, the maps add something to the value of the work. So, too, do the various genealogical tables; while the little bibliographies, though very general, will serve to start the inquiring student in the right direction. It is to be regretted that an insufficient index impairs whatever usefulness as a work of reference the volume might otherwise have had.

COMPARATIVE DISTRIBUTION OF JEWISH ABILITY.

THE pronounced racial characteristics of the Jewish people, with their remarkable persistency of type, have always rendered them a favorite subject for ethnological study. The peculiar environments in which they have been placed, and the almost constant persecution to which they have been subjected, have certainly given their impression to the mental characteristics of the race, and in many respects we see these as sharply portrayed as the peculiar physiognomic cast.

Mr. Joseph Jacobs has recently published (Journal of the anthropological institute of Great Britain and Ireland, February, 1886) an analysis of the characteristics of more than thirty thousand eminent men with especial reference to the Jewish race. The conclusions he arrives at are of the greatest interest, and in some cases unexpected from the crude inductions of common experience.

Jews have no distinction whatever as agriculturists, engravers, sailors, and sovereigns. They are less distinguished than Europeans generally, as authors, divines, engineers, soldiers, statesmen, and travellers, but approximately their equal as antiquaries, architects, artists, lawyers, natural scientists, political economists, scientists, and sculptors. They seem to have superiority as actors, chess-players, doctors, merchants (chiefly financiers), metaphysicians, musicians, poets, and philologists. One would, however, have expected a much larger contingent of lawyers and political economists than is actually found, and art is better represented among them than one would suppose. The sciences also, both biological and exact, show a greater equality than most people would expect. As regards the former, of course Jews have no Darwin. It took England a hundred and eighty years after Newton before she could produce a Darwin: and as the Britishers are five times as many as the Jews, even including those of Russia, it would take, on the same showing, nine hundred years before they could produce another Spinoza; or even, supposing the double superiority to be true, four hundred and fifty years would be needed. But, even in the lower ranks of biology, Jews have done and are doing good work. Bernstein, Cohn, Remak, Rosenthal, and Valentin as physiologists, Cohnheim, Hirsch, Liebreich, Lombroso, and Traube as pathologists, will be recognized; while F. Cohn is perhaps the third greatest botanist in Germany. It

is in abstract science, mathematics and astronomy, that Jews show to more advantage. The history of pure mathematics during this century would show large blanks if the names of Jacobi, Sylvester, Kronecker, and Cremona, were removed. In astronomy we have the cluster of Herschels, Goldschmidt (who discovered fourteen asteroids in the 'fifties' and 'sixties,' when such discoveries were not an every-day occurrence), and W. Meyerbeer (brother of the musician, and author of the first great chart of the moon). Altogether, then, we must conclude that Jews take their full share in the scientific work of the day. In Sir John Lubbock's 'Jubilee speech at York,' we find eight Jewish names out of the two hundred and eighty-nine who are mentioned as contributing to the last fifty years of science: this is considerably above their proper proportion, even when including the Russian Jews. Again: in M. de Candolle's book, 'Histoire de science,' there are ten Jews holding sixteen out of the eight hundred and twenty-four chairs as foreign members of the scientific academies, which fact he uses as a test of scientific ability. This is just the right proportion, the Jews of Europe being seven out of three hundred and thirty-three million.

Less surprise will be felt at the subjects in which Jews seem to show superiority. In acting, a profession better recognized on the continent than here, — and the same may be said of medicine, — in Austria, one may say *ubi tres medici duo Judaei*. The Jewish merchants who get into the dictionaries are, of course, the great financiers. But it is chiefly in music and philology that Jewish superiority is most marked: in music there seems to be six times, and in philology nine times, as much Jewish talent as European. For the former, besides the great names of Mendelssohn, Halévy, Meyerbeer, and Rubinstein, already mentioned, we have many lesser lights, like Sir Julius Benedict, Sir M. Costa, F. Cowen, Joachim, Pauline Lucca, Moscheles, and Sir A. Sullivan. English music, to say the least, would be almost non-existent without these Jewish names. Even more striking is the number of Jewish names distinguished in philology. These are not alone connected with oriental and Semitic philology, like Benfey and Oppert; but they count a goodly number of classical scholars, — Bernays, Bernhardy, Lehrs, Friedländer, and H. Weil, to whom we may add Freund, the author of the Latin dictionary, which is the basis of all those used in England. The names of Lazarus and Steinthal are known wherever the principles of philology are studied. In modern languages, too, Jews have done good work. Sanders has done for German what Littré did for French; and a Jew, the well-known Ollendorff, may claim to have taught languages to the largest number of people by the clumsiest method of teaching.

If we may venture to inquire into the causes of the Jewish superiority established on these somewhat hypothetical grounds, there are various reasons which can be given. We have to take account of their residence in cities, always more conducive to the life intellectual. From this, too, follows their addiction to commerce as distinguished from industry; and as the former implies headwork, and the latter handicraft, mental capacity must be aided by this fact. The care Jews give to their children's education is well known, and must help. All Jewish boys have hitherto had to learn Hebrew, as well as the vernacular, and this must further mental progress. Dissenters generally seem more intellectual, because they have early to think out their differences from the generality. In the case of Jews, persecution, when not too severe, has probably aided in bringing out their best powers: to a high-spirited race, persecution, when there is a hope of overcoming it, is a spur to action. The solidarity of Jews, and the aid they willingly give to young men of promise, assist in developing whatever talent there may be in the community. The happy home-life of the Jewish people, and the practical and undogmatic character of their religion, together with the absence of a priesthood, have contributed to give the *corpus sanum*, and thus the *mens sana*. Jewish reason has never been in fetters; and finally the weaker members of each generation have been weeded out by persecution, which tempted or forced them to embrace Christianity, and thus contemporary Jews are the survival of a long process of unnatural selection, which has seemingly fitted them excellently for the struggle for intellectual existence.

Turning from these general causes, it would be of interest to discover the reasons for the special ability of Jews in music, mathematics, metaphysics, philology, and finance. The chief cause of the musical pre-eminence of Jews, lies, in all probability, in the home-character of their religion, which necessarily makes music a part of every Jewish home; this, too, was the only direction in which their artistic sensibilities could be gratified. Jewish philology is in part due to their frequent change of country, and also to the fact that they have had an additional sacred language besides the vernacular. As regards finance, the Jews have had their greatness thrust upon them: the world forced them to become financiers centuries before finance became a power, and must not complain if Jews now profit by their start in financial experience. Altogether, the productions of Jewish

intellect strike one as being predominantly abstract, — a result, doubtless, of their long life in cities, and exclusion from nature on the one side, and from the education which lies in handicrafts on the other. We may expect great mathematicians and philosophers from them, but not great inventors, biologists, or painters, till they have had time to throw off the effects of their long seclusion from nature.

RECENT CHALLENGER REPORTS.

Report on the Schizopoda (vol. xiii.). By Prof. G. O. SARS. London, *Government*, 1885. 4°.

THE Schizopoda and Cumacea collected during the voyage of the Challenger were placed in the hands of Professor Sars of Christiania for examination and description, and very wisely, for he had done more to elucidate these groups than all other authors combined. This report, by far the most important addition yet made to our knowledge of the Schizopoda, more than justifies the English authorities in intrusting certain portions of the Challenger collections to foreign naturalists. Fifty-seven species of Schizopoda, representing twenty-one genera, are here fully described and very carefully and elaborately figured by the author himself, who says very truly that the collection "has turned out extremely rich, and of very special interest;" but this result is undoubtedly very largely due to the great care with which Professor Sars has examined the miscellaneous material collected in surface-nets, and submitted to him. Forty-six of the fifty-seven species were first made known by the Challenger expedition, and the elaborate working-out of this large number of new forms from widely different regions and depths affords most important new material for discussing the proper subdivision of the Schizopoda and their relation to the other Crustacea.

Professor Sars, I am glad to see, regards the Schizopoda as a suborder distinct from but closely allied to the Decapoda proper, and retains with them the Euphausiidae, in spite of Dr. Boas' arguments that they should be regarded as a distinct order. He also shows that the genus Eucopia, which has been referred to the Penaeidea by Dana and Bate, is a true schizopod, though representing a distinct family. Thus we have four families of Schizopoda: Lophogastridae, Eucopiidae, Euphausiidae, and Mysidae.

The Lophogastridae, which, previous to the Challenger expedition, was represented by a single genus, is here augmented by the remarkable genus Gnathophausia and two new genera. Of Gnathophausia, which was first made known by Willemoes-Suhm during the progress of the expedition, and contains the largest known schizopods, no less than nine species are here described, one of them over six inches in length. The anatomy of the genus is carefully worked out, and its affinities to Lophogaster well shown. All the species of the family appear to be inhabitants of deep water.

The account of the Euphausiidae is the most important and interesting part of the work. Nearly all the species of this family are pelagic in habits; and Professor Sars' careful examination of the surface collections made on the expedition has not only added largely to the number of species made known, but has enabled him to bring together and describe many of the post-embryonal stages of several of the forms. Twenty-eight species representing eight genera of the family are described, and twenty-three of the species and four of the genera are new. The entire anatomy of several species is worked out, and the articular appendages of nearly all of them are figured in detail. Under the genus Euphausia, the peculiar eye-like organs situated on or between the bases of the legs are very carefully described, and apparently well shown to be luminous, and not visual organs. Although many of the species of the family are often taken in the greatest abundance, egg-bearing females are only very rarely seen; and, until very recently, nothing was positively known in regard to the manner of carrying the eggs, a single long-ago-recorded observation of Bell being somewhat doubtful. Professor Sars, however, has now found species of several different genera, carrying masses of eggs beneath the body in the same position as in other Schizopoda, though not enclosed in a pouch formed of lamelliform appendages, thus confirming Bell's observations and those of the present writer, published in 1884.

In the chapter on the development of the Euphausiidae, post-embryonal stages of species of Nyctiphanes, Euphausia, Thysanopoda, and Nematosceles, are carefully made out, and fully described and figured; and this is all accomplished with what is usually regarded as the refuse from the surface-collecting net. These investigations fully confirm the observations of Claus, Sars himself, Metschnikoff, and the present writer, and show that the typical Euphausiidae are hatched, like barnacles and copepods, as true nauplii, with unsegmented body, no compound eyes, and only three pairs of appendages, and that they pass through a long series of intermediate stages to the adult condition. Sars regards this nauplial development as characteristic of all the Euphausiidae, which seems somewhat doubtful when we consider the small number and

enormous size of the eggs of one of the species of Stylocheiron here described.

The Mysidae were far better known than the other Schizopoda, and the account of the Challenger species is consequently less important than that of the other families; still sixteen species belonging to nine genera are described. A short appendix contains descriptions of four ecto- and two endo-parasites of species described in the report.

The fact that the work was written in a language foreign to the author is scarcely noticeable, and errors are rare. A few mistakes have resulted from changes and additions during the progress of the work, as the failure to change the generic name of Amblyops australis on p. 12, and the incorrect statement of the number of genera and species on pp. 63 and 172.

The numerous excellent plates bear the impress of a Stockholm lithographer, and add to the international character of the work.

S. I. Smith.

Lamellibranchiata (vol. xiii.). By Edgar A. Smith. London, *Government*, 1885. 4°.

The report on the bivalve mollusks consists almost exclusively of a list of the various species comprised in the collection, with such remarks as appeared to be of interest, and of the descriptions and figures of the species new to science. The anatomical work on those species of which the soft parts were preserved has been placed in other hands, and is not yet published. The Rev. R. Boog Watson retains the gastropods and solenoconchs, but, after doing certain preliminary work, concluded to relinquish the present group, which was very appropriately placed in the hands of Mr. Smith, well known to all students of the invertebrates as the courteous and hard-working assistant in charge of the Mollusca of the British museum.

The Challenger collection of lamellibranchs was obtained from the dredgings at some hundred and fifteen stations, and comprises about five hundred species, of which four hundred and fifteen were found in water less than two hundred fathoms deep, nine in water over two thousand fathoms deep, and the remainder at intermediate depths. The greater part of the collection, therefore, is not of an abyssal character, and, in fact, forms an important contribution to the fauna of the Southern Ocean, and especially Australian waters; but the portion relating to the deep-sea forms is, of course, the most interesting and biologically most important, and will prove indispensable to all students of that branch of biology. The plates are excellent, and the proof-reading good, though we notice the references to plate vii., in the text, all read plate viii. A few species which came in at the last moment are represented by woodcuts in the text.

The collection shows that no special student of the Mollusca accompanied the expedition; for the opportunities were so great, that a qualified collector would certainly have done much better, both as to the number of species collected and in regard to their biography. It must be remembered that the Challenger party worked with much less perfect instruments and methods than are at present available, and that the loss of time incurred by the use of rope in dredging is doubtless accountable for the washing-out of many valuable specimens which actually got into their dredges. Mr. Smith is quite conservative in his estimation of what constitutes a genus, but we are inclined to agree in his decision that only one new generic group is represented in the collection. This is called Silenia, and is distinguished from Lyonsiella by both anatomical and conchological characters. It was found in the deep water of the South Atlantic. The general considerations of the report are brief. The remarkable sporadic appearance of several forms in widely separated localities (Red Sea and Fiji Islands, Canaries and North Pacific, Australia and West Indies, and the like) is instructively commented upon, though perhaps none of the cases are more remarkable than the recent discovery of Pecten pleuronectes by the U. S. fish commission in the West Indies. The wide bathymetrical distribution of certain species, shown for the West Indies in the preliminary notes on the Blake mollusks, is fully confirmed for other regions by the Challenger collection; e.g., Lima multicostata in two thousand and in one thousand and seventy-five fathoms. Neaera, Arca, and Amussium were among the most frequent and most characteristic forms of the deeper water. Callocardia appeared in very deep water, in about the same latitude, in both the Atlantic and Pacific. On the whole, Mr. Smith concludes that the lamellibranchiate fauna of the deeps possesses no special or extraordinary character. The species are fewer than in shallower water, and new or peculiar forms are still more exceptional. No special modification of color, epidermis, or weight, seems to be correlated with existence in the benthal zone; for most of the species found there belong to genera whose representatives are thin and pale, whether they are found in deep or shallow water. A tabular exhibit of the distribution in depth and area, of the deep-water species, would have been a valuable addition to the report, which has an excellent index to the text and plates.